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THE ROLE OF HABITABILITY INFORMATION IN POST-OCCUPANCY EVALUATI--ETC(U)  
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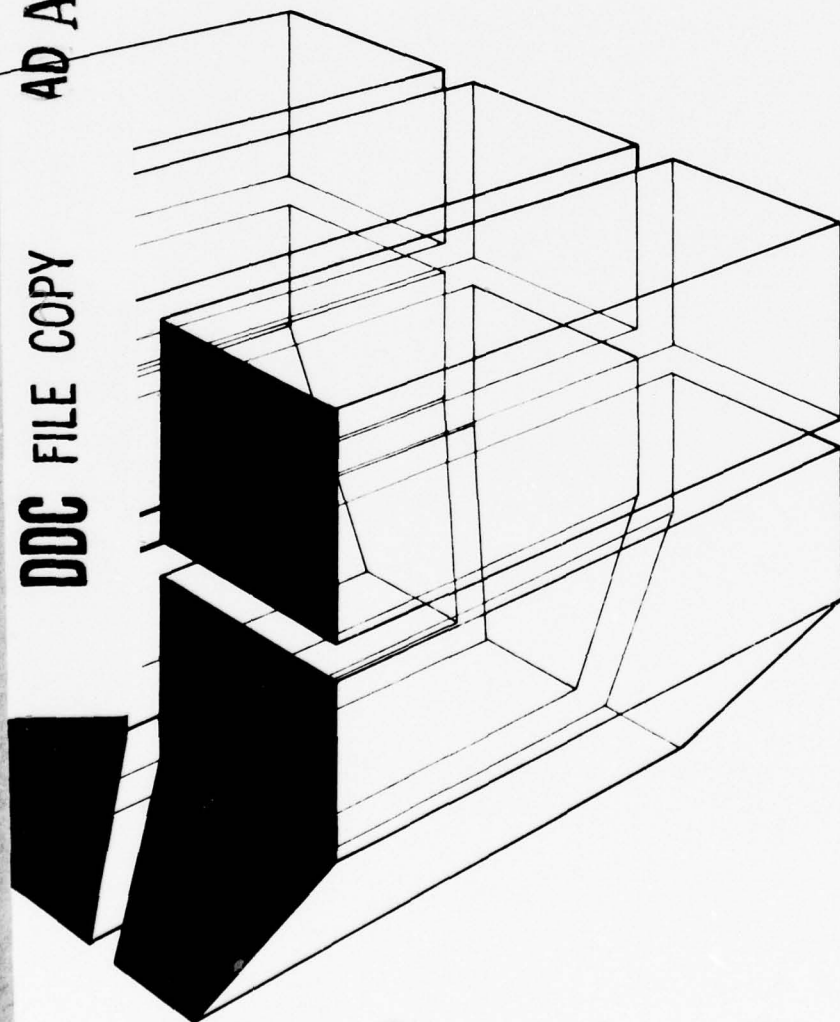
Using Post Construction Evaluation to Validate  
or Improve Functional Requirements and Criteria

THE ROLE OF HABITABILITY INFORMATION  
IN POST-OCCUPANCY EVALUATION

by  
W. D. Veneklasen

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This report investigates the data-gathering phase of post-construction evaluations of military facilities. The principal objective was to develop a procedure to identify physical components of a constructed environment which affect occupants using the facility. Field installation master planners and inspectors were interviewed to find out what evaluation procedures are being used and to find out when the post-completion inspections were conducted. Then a questionnaire for facility occupants was developed, using a set of 13 predetermined

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occupant behavior factors; the questions dealt with the facility's physical components. This procedure tested the applicability and validity of the current post construction/completion evaluation methods as habitability evaluation measures.

It has been concluded that the behavior factors were useful for (1) showing the importance of various environmental factors to the individual occupant, and (2) evaluating the appropriateness of a specific setting to individuals and organizations. Continued refinement of the data collection techniques will contribute to a data file on facility types.

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## FOREWORD

This report was prepared for the Directorate of Military Programs, Office of the Chief of Engineers (OCE), under Project 4A762731AT41, "Design, Construction and Operation and Maintenance Technology for Military Facilities"; Technical Area T3, "Architectural Research and Development in Support of Military Facilities"; and Work Unit 010, "Using Post Construction Evaluation to Validate or Improve Functional Requirements and Criteria." The applicable QCR is 1.01.012. The OCE technical monitors for this work were Mr. Richard Cramer and Mr. Robert Shibley, both of DAEN-MPE-B.

The work was performed by the Energy and Habitability Division (EH), U.S. Army Construction Engineering Research Laboratory (CERL), Champaign, IL. The CERL Principal Investigator was Dr. W. D. Veneklasen, who was assisted by Mr. R. Saxler. Program review was provided by Mr. R. Porter and Dr. R. M. Dinnat. Mr. R. Donaghy is Chief of EH. COL J. E. Hays is Commander and Director of CERL, and Dr. L. R. Shaffer is Technical Director.

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## THE ROLE OF HABITABILITY INFORMATION IN POST-OCCUPANCY EVALUATION

### 1 INTRODUCTION

#### Background

AR 10-5<sup>1</sup> directs the Chief of Engineers to design and construct facilities needed by other Army organizations. In constructing these facilities, the Chief of Engineers is committed to a goal of customer satisfaction. At least three major factors contribute to this satisfaction: (1) effective project development and design procedures, (2) excellence of construction techniques, and (3) functional ease and psychological satisfaction during occupancy. The first two factors have been described in an earlier CERL report.<sup>2</sup> The third factor is loosely defined and difficult to quantify.

By the time a facility is occupied, the first two factors have already made their major contributions to the military customer's satisfaction. Only after a completed facility is occupied can it be evaluated for how well it meets the customer's needs. For this report, the customer is defined as the occupant who actually uses the facility in question, not the funding agency or the owner.

Post-construction evaluation and inspection programs are outlined in ER 415-345-38<sup>3</sup> and ER 415-3-11.<sup>4</sup> The first inspection is typically conducted when the building is transferred to the installation. The inspectors insure that the completed facility meets the contract specifications. This is basically a checklist approach, in which the facility is inspected and items are checked off if they meet contract specifications. When all items are checked off, the facility is accepted by the installation. Six months after occupancy begins, ER 415-3-11 calls for a post-completion inspection. This is usually a walk-through visual in-

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<sup>1</sup> AR 10-5, Department of the Army (Department of the Army, 1 Apr 1975).

<sup>2</sup> R. L. Brauer and D. L. Dressel, Concepts for the Generation, Communication, and Evaluation of Habitability Criteria, Special Report D-78/ADA041187 (U.S. Army Construction Engineering Research Laboratory [CERL], June 1977).

<sup>3</sup> ER 415-345-38 Transfer of Completed Construction Projects to Army, Air Force, and other Government Agencies (Office of the Chief of Engineers [OCE], 1 March, 1966).

<sup>4</sup> ER 415-3-11 Inspection of Completed Construction Projects and Design, Coordination (OCE, 15 July 1975).



spection by some of the installation's engineers, representatives of the construction company, and representatives of the Facility Engineering Divisions of OCE, the Corps of Engineers Division and/or District, the installation Facility Engineer, and possibly a Major Command. The comments provided by these casual inspections are usually not sufficient to assess meaningfully the functional occupancy conditions of the facility; in addition, they do not provide meaningful feedback for improving the construction process or providing information.

### Objective

The overall objective of this research is to determine how post-construction evaluations can be used to assess facility appropriateness for organizations and occupants. In any type of evaluation there are at least three implicit phases: (1) data must be collected, (2) the collected data must be examined and/or analyzed, and (3) conclusions must be drawn from the data analysis.

This study is concerned with the data-gathering phase. The principal objective of this report is to develop a procedure or instrument for identifying those physical components of the constructed environment which impact occupants using the facility. The components to be identified are those whose design was based on a project-specific Department of Defense (DOD) facility type.

Once the procedure or instrument has proved reliable, the information obtained by using it can be merged with the information used to generate functional requirements for design. (See CERL Interim Report D-80.)<sup>5</sup>

### Approach

Research for the data-gathering phase was conducted in two steps. First, researchers became thoroughly familiar with current post-construction/completion evaluation methods. These methods were examined and reviewed to determine their purpose, how often they are conducted, what procedures they involve, and how they insure facility appropriateness for the occupants. In the second step, field installation master planners and inspectors were interviewed to find out what (if any) evaluation procedures were being followed, and when (and if) the 6-month post-completion inspections were conducted. A set of 13 predetermined occupant behavior factors was then used to generate a

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<sup>5</sup> D. L. Dressel, R. L. Brauer, W. D. Veneklasen, and J. H. Burgess, A Prototype Procedure for the Local Generation of Facility Requirements, Interim Report D-80/ADA043172 (CERL, July 1977).

comprehensive series of questions about the facility's physical components. This procedure tested the applicability and validity of the methods as habitability evaluation measures for military facilities. In a succeeding phase of the overall research, recommendations will be developed for preparing a post-construction habitability evaluation document which occupant groups can use to assess the appropriateness of the completed facility; this information will then be reviewed by the inspection team.

Figure 1 illustrates the flow of events for the overall research. The final results of this study will (1) identify habitability issues in newly completed facilities, and (2) provide a method for determining the environmental sources of those identified issues.

#### Mode of Technology Transfer

The results of this study will impact ER 415-345-38 and ER 415-3-11. In addition, the results will eventually be transmitted to field inspectors and installation users through a guidance document such as an engineer pamphlet or technical manual.

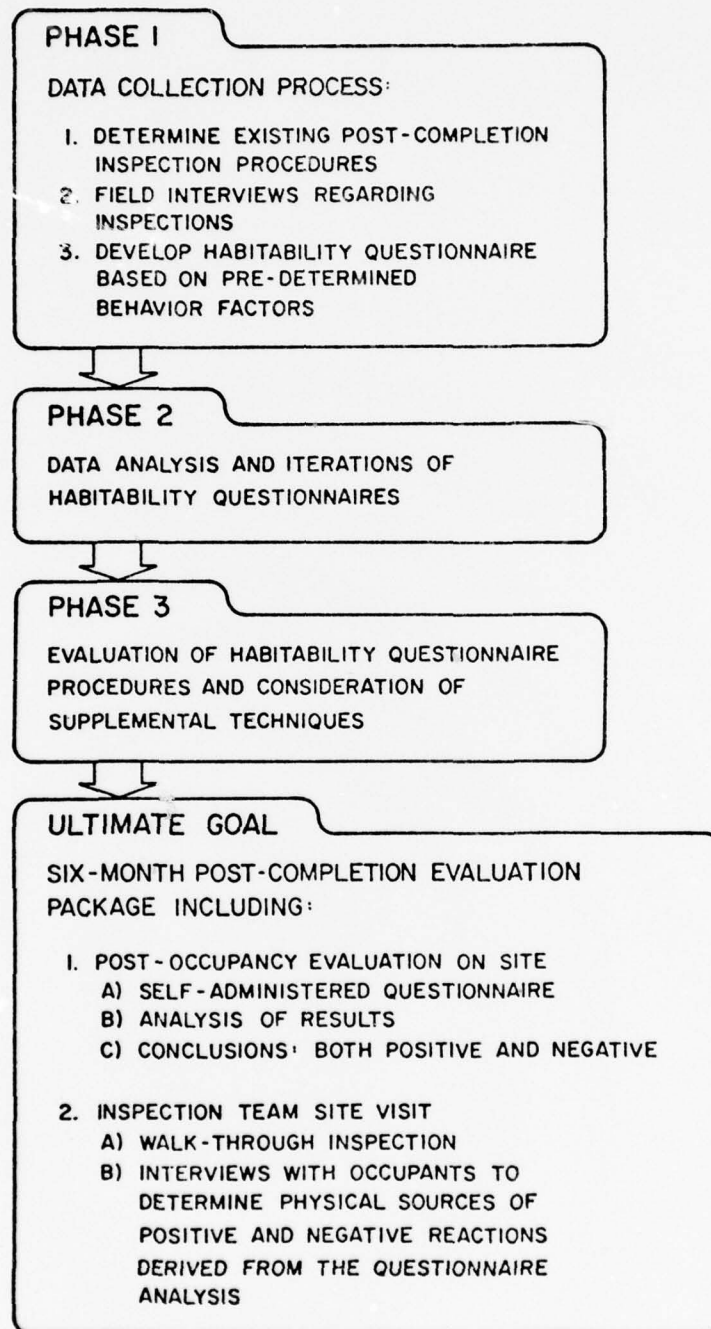


Figure 1. Research sequence.

## 2 METHODS

### Interviews

Discussions with installation personnel focused on two primary areas:

1. Identifying positive and negative facility conditions that impact the occupants.
2. Identifying how post-completion inspections are processed.

When there was a facility inadequacy, two issues were discussed: first, that an inadequacy had been recognized, and second, that the inadequacy must be specifically identified; i.e., what are the possible environmental sources of the problem, and what are the physical components that impact the users of the facility.

### Questionnaire

A 96-item questionnaire was developed to explore possible occupant behavior factors that are responsive to the impact of the physical components of the constructed environment. Questions were written to fit into 13 intuitively determined score areas that would clarify relevant behavior factors. (A "score area" is a statistically clustered set of questions [or items] that all commonly define a given concept or factor.) Table 1 describes the factors tested.

The questionnaire established a comprehensive measure of the facility's physical elements that could be used to systematically and consistently evaluate new facilities during the 6-month post-completion inspection. The score areas described in Table 1 were used as a starting point to determine whether the behavior factors had any common meaning for the respondents.

The individual items were analyzed to find: (1) how they related to other items in the score area, and (2) how all the items were inter-related regardless of score areas. Once a complete set of measures is developed and refined, they can be used in three very important ways: (1) to evaluate the habitability condition of a newly occupied facility; (2) to validate the functional requirements generated by potential occupants while the facility is being planned; and (3) as "feed-forward" requirement information for similar facilities being designed.



Table 1  
Behavior Factors

<u>Behavior Factor</u>	<u>Number of Items</u>	<u>Description</u>
Sociability	9	Enabling or inhibiting social interaction. Extent that elements support the presence of several persons.
Privacy	13	Degree to which the space is shared, based on visual, acoustic, and physical control.
Choice	6	Degree to which a space allows individual expression and co-existing behaviors.
Comfort	4	Degree of spatial, acoustic, and visual comfort.
Imagery	9	Degree that a space is identifiable in relation to its purpose.
Efficiency	7	Enabling or inhibiting direct circulation or simple operation.
Flexibility	7	Degree to which the space can be modified and is responsible to user needs.
Formality	6	Degree that activities are structured by the space, which also prescribes behavioral rules.
Territoriality	6	Degree to which the space allows ownership and identification.
Activity	8	Degree of active and dynamic usage of the space.
Physical Working Conditions	4	Condition of equipment furnishings and cleanliness of the work area.
Task Performance	5	Degree to which the space supports the performance of work tasks.
Crowding	6	Perceptual feelings of comfort of the person to square footage ratio (density).



It was extremely important to develop an instrument that field inspectors could use eventually. Appendix A provides a complete copy of this questionnaire.

Two field test sites were selected for the study: (1) recently occupied administrative office building at the Defense Language Institute, Presidio/Monterey, CA, and (2) two tactical equipment shops at Fort Carson, CO. These facilities were occupied by artillery personnel and infantry personnel, respectively.

The questionnaires were completed at the individual work stations. Anonymously completed questionnaires were collected or returned to a designated office at the test site and mailed to CERL for coding and analysis.

### 3 RESULTS

#### Interviews

Results of the personal interviews indicated that the first objective should be to determine how a facility affects the satisfaction of the occupants. All that must be known initially is that a problem is evident, not necessarily how it might be specifically related to the environment. For example, problems could be excessive time for servicing a vehicle, lack of student attention in a service school classroom, or high absenteeism in an administrative office staff.

While there is no way to identify issues nor any method to specify and document those issues, there is also no way to know when building occupants are satisfied with their new facility. Too often a lack of identified issues is equated with satisfaction. In reality, however, the occupants may have simply learned to live with the problems, since they were never given the chance to evaluate the facility.

#### *Identification of Problems Related to the Facility Components*

Once a problem has been recognized, it must be identified or defined in terms of facility components. This identification can be made by checking the formal organizational structure or talking with the occupants of the facility. The problem may result from a change in the organizational structure. The organizational structure of military facilities changes fairly frequently, and if the facility design cannot be responsive to these types of changes, problems are almost certain to arise.

If the issue cannot be identified by the organizational structure, then the major occupants who use and/or live in the facility may be able to identify it. Regardless of the identifier, at least a percentage of the occupants may be a part of the formal organizational structure. For this reason, it is almost mandatory to obtain occupant feedback.

The formal organization may not be totally housed in the new facility, and therefore may not provide the necessary hands-on information. Occupants, whether they belong to the formal organization or not, use a facility daily and are most able to provide critical feedback on how the facility performs.

#### *Reasons for Occupant Problems That Relate to the Facility*

The following are the types of questions that the interview participants indicated an inspection team should be asking about the total project planning-to-occupancy process during the 6-month post-completion inspection.

1. Is the original Functional Requirements Document still available? If it is, it should be checked against the finished facility. This check should be made to determine not only the physical requirements in square footage, utilities, distance, siting, materials, etc., but also to examine the organizational requirements (if they have ever been generated).

2. Were faulty or incomplete Functional Requirements generated at the installation level? Functions and the resultant activities may not have been identified early in the planning process or may have been incorrect. When this occurs, environmental problems will probably be discovered when the facility is occupied.

3. Were the local Functional Requirements misinterpreted in the review process at the District level? Once the responsible organization has generated its functional requirements for a new facility, the Directorate of Facilities Engineering (DFAE) at the installation sends them to the Corps of Engineers District. It is possible that during this process, the requirements may have been misinterpreted or even changed.

4. Were faulty criteria used at the District level? When the requirements are provided to the Corps District office, they are checked against the set of criteria established by DOD, the Department of the Army (DA), or OCE for a facility type. These criteria must be evaluated and updated regularly.

5. Did the Architect/Engineer (A/E) arrive at a faulty design solution? The District which has assumed the design and construction responsibility gives the A/E a set of requirements and criteria. If the A/E is given faulty requirements and criteria, he/she is likely to provide an ineffective design solution. Even if the requirements and criteria are correct, the A/E may not solve the design problem appropriately.

6. Did the formal organization change? It is usually 4 years from the time a new facility is determined as "necessary" (AR 415-15) to the time that it is actually constructed and occupied. Organizational changes during that time can make a facility oversized, undersized, or functionally inadequate.

7. Were there changes in organizational policies? Whether or not the formal organizational structure changes, there may be changes in its policies. A policy change may mean more extensive use of a facility (from an 8-hour duty day to a 24-hour duty day) or the reverse.

8. Was there a mission change? For example, a new training facility may be completed to support the training of helicopter mechanics; however, in the post-design/pre-occupancy construction stage, the mission may be expanded to include the training of fixed-wing mechanics. While the impact on classroom space may not be too drastic, the training areas where engines are serviced are severely affected, e.g., equipment, tools, racks, cranes, etc., are all different. Thus the finished training facility will support only part of the mission.

9. Did the occupants change? In military organizations, the personnel turnover will be nearly 100 percent during the time between pre-design planning and occupancy. Given a standardized program, all military personnel are theoretically alike. However, a problem might arise because of the lack of continuity of personnel. The original personnel will very likely never occupy the facility for which they generated a Functional Requirements document; therefore, the new personnel may not have first-hand knowledge of how facilities components are supposed to function for them.

10. Did the facility itself change? Changes could be made during construction, or a renovation could be made after occupancy. The budget constraints may limit the extent of changes even if potential problems are identified during the construction. Therefore, the new occupants may have to accommodate the physical components of their new facility that are "only half as bad as it might have been." Any changes during or following construction are well documented and must be evaluated.

#### *Current 6-Month Evaluation Comments*

Presently, the 6-month evaluation is of an equipment and material selection and/or engineering nature. The reports cite material and mechanical problems, support systems that do not meet specifications, and other technical considerations called for in ER 415-3-11.

One such evaluation report was examined for its scope and comments. Following are some of the comments:

"Fully glazed entrances (storefront type) do not stand up in hard usage areas such as barracks and NCO clubs. In the NCO club, glass has been replaced with plexiglass which is rather poor in appearance. The basic problem is the desire to obtain a pleasing appearance and at the same time provide a GI-proof installation. Suggest DAEN-MPE-B and DAEN-MPE-S study the problem with a view of obtaining a more sturdy installation."



"Wall-mounted urinal screens have become loose where attached to the wall. Guide specification provides for both floor-mounted and wall-mounted screens. Floor-mounted should be selected for areas of rough usage since they are more likely to withstand the abuse they will receive."

"Ceiling heights in entries, hallways, and private rooms were incompatible with the functions therein. Entry and hallway ceilings could be easily reached by hand, while ceilings in private rooms were 10 feet and more in height. This resulted from the mechanical concept where the space above the hall ceiling was used for piping and for fresh air supply to the individual ceiling hung units in each room. Ceilings in the hallways were thus easily damaged and the high ceilings in the private rooms created a cavernous, cell-like space unlike proportions normally associated with living spaces. Current Engineering Inspections should be amended to specify maximum and minimum ceiling heights for functional areas to gain desirable proportions. The EIs should also require that the design and selection of mechanical systems be coordinated with this requirement."

"Nonstandard windows required special cut replacement glass. Recommend guide specs be reviewed to insure that those can accommodate standard sized glass."

"In general, the user was quite satisfied with this facility. Red clay tiled roofs, white concrete slump block walls (carried inside) and a Spanish-southwest motif made for an attractive facility. The 118 parking spaces provided were adequate and desirably located on the site. Parking in the shopping center nearby serves as overflow."

Since many areas of the recreation center were carpeted, consideration should be given in the use of doors with enough clearance to close over carpet in those areas where carpet installation might be expected.

#### *Current Post-Completion Evaluation Practices*

Installation personnel were asked what they thought of the post-completion inspections, their frequency, their content, and what should be included that presently is not. They were also asked to comment on the membership of the inspection teams and the additional sources that could be used. Following are some of their comments:



"The post-completion inspection, unless it's done conscientiously and systematically on each and every job by the District personnel where they can feed it right back to their design, is meaningless."

"The District used to do the post-completion inspection. Personally, I thought it was one of the most significant parts of their functions because you could really see the end result after the job was done. We didn't go after usability so much but we talked to the users."

"There is usually a set of minutes from the post-completion session which sometimes reflects the happiness of the using service. Frequently, the using service functions have changed after designs were completed so that some portion of the facility is no longer functional. This is not to say that it's not the function they required back in the beginning."

"The questions that are asked during post-completion inspection are how is the building functioning; are you getting heat; are you getting air conditioning; are there leaks in the roof; are things falling apart; how happy are you with the building?"

"I have a feeling the OCE looks at construction quality. I don't think they pay as much attention to the use function as they should."

"You seem to have a way of getting information formally on how the facility worked out from the using service. Our people are over at the installation at regular intervals. If things are good, they sometimes cheer about them; if things are bad, they darn sure hear about it."

"I usually send our people out when the building is completed to see if the water runs when it's turned on; whether any items are damaged; and if the air conditioner works."

"The follow-up inspections are not carried out on a scheduled basis, at least not here. Maybe there are no funds for it, but there is no clear reason for not conducting them. Regardless of being directed to conduct these follow-up inspections, they are typically done on an informal basis where I'll drop by to see how things are going and if there are any problems and so on."

"Initiation for a formal follow-up can be made by several sources. DFAE or some other Division representatives such as utilities, food service, and so on, would identify their particular problem."

"The user may also have problems in dealing with a facility."

"Special interest groups who may not even be located on an installation, such as communications personnel, can find problems with the facility but they never talk to you."

"DFAE inspectors can sometimes find misfit problems on an informal basis, but it is a little difficult when inspections are not carried on systematically."

"Post-completion follow-up inspections are conducted by the DFAE inspection branch, the facility has already been turned over to the installation and it is their responsibility. By this time, the Corps of Engineers District office has basically signed off on the project. Master planning does not initiate the follow-up inspections, but may be called in as a resource once a misfit has been identified to write up mods to resolve the problem."

"While the master planning branch of the DFAE has not prescribed the role of follow-up evaluations, we would like to be involved in such evaluations; we see a lot of utility in it. Of course, there are personnel restrictions, qualification restrictions, but we'd like to be able to see who could recognize functional errors in the evaluation stages following construction."

The interviews and examinations of inspections/trip reports illustrate that most of the feedback is concerned with the technical problems outlined in ER 415-3-11; however, this regulation does not consider the habitability of the facilities for the occupant. Specifically, there is no prescribed method for determining from the occupants whether a facility is crowded, too spacious, inflexible, too formal, whether it allows for adequate personal space and territory, or whether it is comfortable. Also, the occupants have no way of communicating whether a new facility provides for their privacy. The current methods provided no way to determine which physical components of a facility are related to occupant task performance and satisfactions.

It was discovered that the 6-month post-completion inspections are not conducted regularly. The only explanation offered was that the Corps District offices may find the follow-up inspections too expensive to conduct unless absolutely necessary. When the inspections are conducted, they amount to little more than a walk-through tour of the facility. It is extremely uncommon for the inspectors to actually interview facility occupants; when an interview is conducted, it never concerns the functional appropriateness or habitability of the facility.

### Questionnaire

Technical problems can be and are identified through the use of post-construction evaluations; however, there is no way of systematically documenting the occupants' reaction to their environment and the impact that the environmental components have on their task performance and satisfaction. The questionnaire was developed to obtain occupant feedback about the appropriateness of a facility.

The questionnaire was based on the 13 behavior factors described in Table 1. These factors were used as an initial set of categories to provide a comprehensive view of the occupant experiences that should relate to the physical elements in the constructed environment.

Printed questionnaires were completed and returned for data analysis by 118 respondents. Eighty respondents were from the office facility at Monterey, 14 from the Artillery Tactical Equipment Shop at Fort Carson, and 24 from the Infantry Tactical Equipment Shop at Fort Carson. Results of the various types of analysis yielded some interesting information and point to future improvements in the use of this information for determining facility habitability appropriateness. All results were obtained through computer programs in the Statistical Package for the Social Sciences (SPSS)<sup>6</sup> series.

### *Analysis I*

The SPSS Condescriptive program was used for this analysis. This computer program lists the number of alternative responses (A, B, C, D, E; yes or no) for each question, and then lists the absolute frequency per response and converts the number to a percentage. For example, a question may be answered "yes" or "no." Of the 118 persons answering the question, 38 (or 32.2 percent) answer it "no." The program also computes the statistical mean and standard deviation for each question and indicates how many people failed to answer it or left it blank.

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<sup>6</sup> N. H. Nie, C. H. Hull, J. G. Jenkins, K. Steinbrenner, and D. H. Bent, Statistical Package for the Social Sciences (McGraw-Hill, 1970).

Because this computer program considers only the aggregate data, all samples are lumped together, and information is provided on the single "grand" sample. Results of this analysis indicated that individual items yielded a fairly normal dispersion across the alternatives for each item. There were few missing or skipped items, which indicated the degree of the respondent's willingness to answer all questions relevant to their environment. Most computer screening programs are designed to eliminate any question which is unanswered by more than 10 percent of the respondents. Using this criterion, no item would have been dropped from the analysis.

### *Analysis II*

If the questionnaire has been administered to more than one group, the Condescriptive program cannot identify the way each group responded to each question. Because this questionnaire was administered to three diverse groups of building occupants, the Crosstab computer program was used to further disaggregate the data. This program works like the Condescriptive program except for two major differences. First, it lists how each group responded to each alternative of each question and puts the results in tabular form (see Table 2). Second, it computes the Chi-Square coefficient, which compares the obtained number of responses per cell to an expected number per cell. When the obtained versus the expected response is statistically different, the pattern of response demands a closer look. This Crosstabs analysis provided the most interesting and useful results.

When the questionnaire was administered to different user groups, it was hoped that each would show a different response pattern. This would indicate that the questionnaire was sensitive to various facility types while still having utility for all. Generally speaking, differences would then be a matter of degree relative to facility type. For example, the need for privacy to make telephone calls may be high for anyone regardless of facility type. In the groups examined here, the occupants of the Tactical Equipment Shop very seldom had adequate privacy for telephone calls, while the office occupants did. While the need for telephone privacy was high for both types of occupants, the Tactical Equipment Shop failed to satisfy this need, but the office building met it quite well.

On an item-by-item basis, this type of information is very useful for questionnaire development and for providing feedback on individual physical components of the environment. The items providing the best evaluative feedback can then be compiled into a checklist which can be



Table 2

## Example of Condescriptive Program Output

Q 68: Do you have enough privacy for telephone calls?

	Almost Always	Quite Often	Occasionally	Not Very Often	Almost Never	
Artillery Shop	1	0	1	4	8	14
Infantry Shop	1	0	5	4	9	19
Office	26	15	12	14	13	80
	28	15	18	22	30	

Raw Chi-Square = 26.8 with 8 degrees of freedom

Significance = .0008

Number of missing observations = 5

used to "score" the success of a building and to identify issues requiring further examination. The use of such a checklist would provide an evaluation of a building before a visit by the inspection team. If the area of privacy was scored low, then a closer examination by the inspection team would determine whether the problem is inadequate privacy for telephone calls or intrusion into the workspace by others, etc.

*Analysis III*

To observe the interrelationships of the individual items in the questionnaire, the SPSS Factor Analysis program was used to examine the data on a larger scale. The computer first generates a correlation matrix of all the items. In this case the matrix was 89 X 89 (all 89 items were compared to each other). The demographic items were not included in the analysis because of their possible contribution to the overall variance.



The correlation matrix was then visually screened to determine (1) the total number of correlations greater than .50 per score area, and (2) the number of within-score correlations greater than .50. Again, the 13 behavioral score areas were used only to group sets of items around common elements, and not as ends in themselves. Table 3 shows the score areas and the relevant statistics.

Examination of the behavior factors and the items for each revealed a phenomenon that at least partially explained the low number of within-score intercorrelations. This occurrence was the differential response within each behavior factor/score area. The respondents reacted to the questions for each behavior factor in two ways. First, they responded to questions that did not specifically refer to the facility itself but to their own attitudes toward the behavior factor. For example, when one question asked whether it was important to them to be able to close a door to achieve privacy, 68 percent responded that it was. In the second type of response, the occupants related the behavior to their immediate work environment and its physical components. This was revealed again in the behavior factor of privacy. While 68 percent of the occupants indicated that the ability to close a door to achieve privacy was important to them, only 26 percent indicated that they were satisfied with their privacy in the facility. Table 4 illustrates how the privacy items were divided.

The importance of such a phenomenon to this research was that all the behavior factors may be important to the occupant but not necessarily relevant to the facility which the occupant is evaluating. The following example shows in detail how this dichotomy existed in the "privacy" factor; the remaining behavior factors are discussed less extensively.

Privacy. For almost every occupant, there are elements of privacy that impact task performance, behavior, and psychological reactions to a facility. As Table 4 indicates, two elements are addressed by the behavior factor questions;

1. Is the behavior relevant to the occupants of this facility type?
2. Is the facility then responsive to that behavioral need?

To determine whether the behavior factor is relevant to the occupants, they are asked about general issues of privacy which might be important to them. To answer the second question, occupants are asked about the physical components that provide the privacy in the facility they are evaluating.

Table 3  
Correlations by Score Area

<u>Behavior Factor</u>	<u>Number of Questions</u>	<u>Total Number Score Correlations</u>	<u>Number of Within-Score Correlations</u>
Sociability	9	13	0
Privacy	13	71	9
Choice	6	4	1
Comfort	4	57	3
Imagery	9	4	2
Efficiency	7	47	3
Flexibility	7	22	2
Formality	6	23	1
Territoriality	6	26	1
Activity	8	16	3
Physical Working Conditions	4	26	1
Task Performance	5	10	0
Crowding	<u>5</u>	<u>53</u>	<u>2</u>
	89	372	28

Table 4

Example Intercorrelation Structure for Privacy Questions

Privacy items relevant to the facility being evaluated:

- Question #18: How do you feel about your personal privacy?
- Question #68? Do you have enough privacy for telephone calls?
- Question #71: Do you find privacy a problem?
- Question #72: Are you able to have confidential conversations?

Privacy items relevant to occupants in this facility type:

- Question #6: Is it important for you to be able to control who and when people can have access to you?
- Question #21: How important is it to you to be able to close a door to achieve privacy?
- Question #58: How important is it for you to be completely by yourself when you want to?

Intercorrelations of "facility"  
privacy items

	#18	#68	#71	#72
#18	-			
#68	.65	-		
#71	.59	.62	-	
#72	.53	.64	.50	-

Intercorrelations of "occupant"  
privacy items

	# 6	#21	#58
# 6	-		
#21	.51	-	
#58	.28	.54	-

These two levels of information are equally important. One level is concerned with the needs of the occupants which will vary from one type of facility to another and which will also co-vary in degree of importance. The second level evaluates how the particular facility meets the occupants' needs.

Neither level has meaning or utility by itself. While it may be nice to know if behavior factors are important to building occupants, it is not necessary unless it is somehow related to a particular physical component of a facility. The corollary is that information on how a facility meets occupant needs is meaningless unless it is known how important those needs are to the occupant. For example, some occupants may state that it is important to be able to control what other people have access to them and when. This may be interesting in itself when defining the concept of privacy but it is meaningless in a personnel office or maintenance shop where a major portion of the occupant's job responsibility is to be completely accessible to "customers."

Both levels of information within a behavior factor are important and must be obtained simultaneously. Analysis of the questionnaire most clearly illustrated the dichotomous levels of information in the "privacy" factor, but the other factors also appeared to follow the same trend. The facility-related and occupant-related levels of information can only be sketched for the other behavior factors until more research is conducted.

Sociability. Occupants of any facility need to seek the companionship of others and to socialize. This need, however, may be misplaced in the work setting. In some work settings, socializing may distract the occupant from important job responsibilities. However, if the facility being evaluated is a barracks or a dining hall, the degree of "appropriate" sociability will be different than for the work setting and will be more significant to the occupant. The situation is then one in which the occupant's need for socializing is not met by the facility being evaluated. Whether or not sociability is a problem issue is contingent upon the facility type.

Choice. Most persons prefer to have some choices rather than always conforming to the mandates of others. This could include a choice of temperature settings, alternate places to sit in a dining hall and an alternate number of persons to sit with, and the individual choice regarding pictures, posters, books, desk sets, tool arrangements, etc. This degree of choice will vary by individual and place and by organizational policies and rules (which pre-determine thermostat settings, working hours, permission to nail up picture hangers, etc.).



Comfort. Occupant comfort can involve noise levels, lighting glare or dimness, mix of colors and density, and heights of work surfaces. While comfort may be important to the individual, there may be some sacrifices of certain comfort features on the job. Machine shops, for example, are noisy and cannot be as acoustically "comfortable" as the occupant would prefer.

Imagery. Space that is identifiable in relation to its purpose may be more significant to an individual evaluating a work space than to an individual evaluating a barracks room. In a work setting, it may be important to a stranger (not necessarily the occupant) to be able to recognize that a room is a classroom and not the library.

Efficiency. Efficiency may be a matter of individual interpretation relative to a specific setting. Direct circulation is likely to be more necessary in a dining hall or an office than in a barracks. In fact, in some settings like museums and gift shops, inefficiency is designed into the structure so that visitors will browse rather than pass through.

Flexibility. In a residence, the occupant may rearrange furniture for the sake of change or to make room for additional pieces. However, in a work setting, the environmental components may have to be modified to meet changes in job requirements. In either case, the environment must be responsive to occupant needs.

Formality. Does the space structure activities that are to be allowed there, and does the space prescribe behavioral rules? This factor may not be important to the individual in some settings but it may be important for the image of the space or its owner. An example might be the way a classroom is furnished with fixed straightbacked chairs, where no student-to-student, face-to-face interaction is expected or tolerated. Orientation of the desk and furniture in an administrative office can state that the office occupant is the "authority figure" and should be regarded as such, or that the occupant is the "decision maker" and will accept other input for the decisions.

Territoriality. Perhaps more than in any other organization, it is important that military organizations encourage unit pride. The more obvious indicators are signs, banners, and plaques. More subtle identifiers of ownership could be the use of colors (blue partitions for the U.S. Navy recruiter, green for the U.S. Army recruiter, etc.). Most humans have a need for a place that they can identify as their own, or a secondary place like an office or shop that "belongs" to a group.

Crowding. This behavior factor is almost purely individual in interpretation. Crowding is a perceptual phenomenon relative to the density of occupants. In most situations, crowding has negative overtones, indicating that the individual feels cramped and unable to perform because of the crowded condition. On the other hand, crowding is expected and sometimes sought at sporting events, parades, parties, etc.

#### 4 ULTIMATE USE OF PRODUCT

Ultimately, this research will provide a post-occupancy evaluation package which will include a habitability evaluation instrument or questionnaire, a scoring manual, and guidance feedback. The questionnaires can be administered 6 months following occupancy and can be scored at the installation. Results of the evaluation will indicate both problem areas and positive responses to the new facility before an evaluation team site visit. The site visit regarding the appropriateness of the facility will then become much more productive and systematic by using occupant feedback. When the inspection team arrives, the issues will have already been identified and can be discussed in more precise terms.

The guidance portion of the evaluation package will include comments on how issues can be corrected or brought up to a more acceptable level for the occupants. On the other hand, positive features will be a matter of record and can be used to design similar facilities.

Development of such an evaluation package depends on the refinement of the habitability data-gathering techniques described in Chapters 2 and 3, and the validation of the concepts used in those techniques.

## 5 CONCLUSIONS

The effort to develop a habitability data-gathering technique has made significant progress. The interviews, which pointed out deficiencies in the 6-month post-construction inspection, guided the development of a questionnaire based on 13 behavior factors. The behavior factors have been shown to be useful in two ways: (1) showing the importance of various environmental factors to the individual occupant regardless of the physical setting, and (2) evaluating the appropriateness of a specific physical setting to individuals and organizations. Continued refinement of the data collection techniques will contribute to a data file on facility types.



## 6 RECOMMENDATIONS

### Long Term

Figure 2 illustrates the chronological sequence of design process events which result in a new facility; the figure also shows how post-occupancy evaluation provides the feedback loop to upgrade the existing design information. To complete the feedback loop, the extended questionnaire validation should be conducted in a variety of physical settings with a wide variety of respondents.

Until the recently developed improvements in the Project Development Brochure (PDB) can be consistently applied in the field, there is no systematic way of checking back on the requirements which were generated for the design of the facility. Work should also be done to more precisely identify the physical components that are relevant to the behavior factors. Thus, some behavioral requirements will then be a matter of record in the PDB and can be used as part of the standard for the appropriateness of the facility for the occupants.

To reach the ultimate habitability evaluation package, a time-consuming procedure must be followed. Data analysis then will show that some of questionnaire items should not be retained, while others should be only slightly modified and used again. This procedure should be reiterated until the constructs (behavior factors) and their supporting physical components are clearly defined and useful as feedback.

Specifically, the procedure involves generating a pool of questionnaire items (as many as 400) that will be field-tested and reduced to the 75 to 100 questions that define the behavior factors. Data on the questions and the supporting physical components will be kept on a computer file by facility type. Figure 3 shows the staggered administration of the 400 questions so that no occupant group will have to respond to more than 100 items.

### Short Term

While this research has not yet produced a comprehensive, systematic procedure for obtaining occupant input, it does suggest an interim method which should be used while the long-term refinement continues. A simple checklist should be administered at the installation 6 months after occupancy and prior to a site visit by an inspection team. The occupant should rate the new facility and thereby identify both positive and negative reactions to the facility's environment. The checklist would not identify specific sources of issues as the eventual procedure should, but would determine generic issues that could then be investigated by the inspection team.

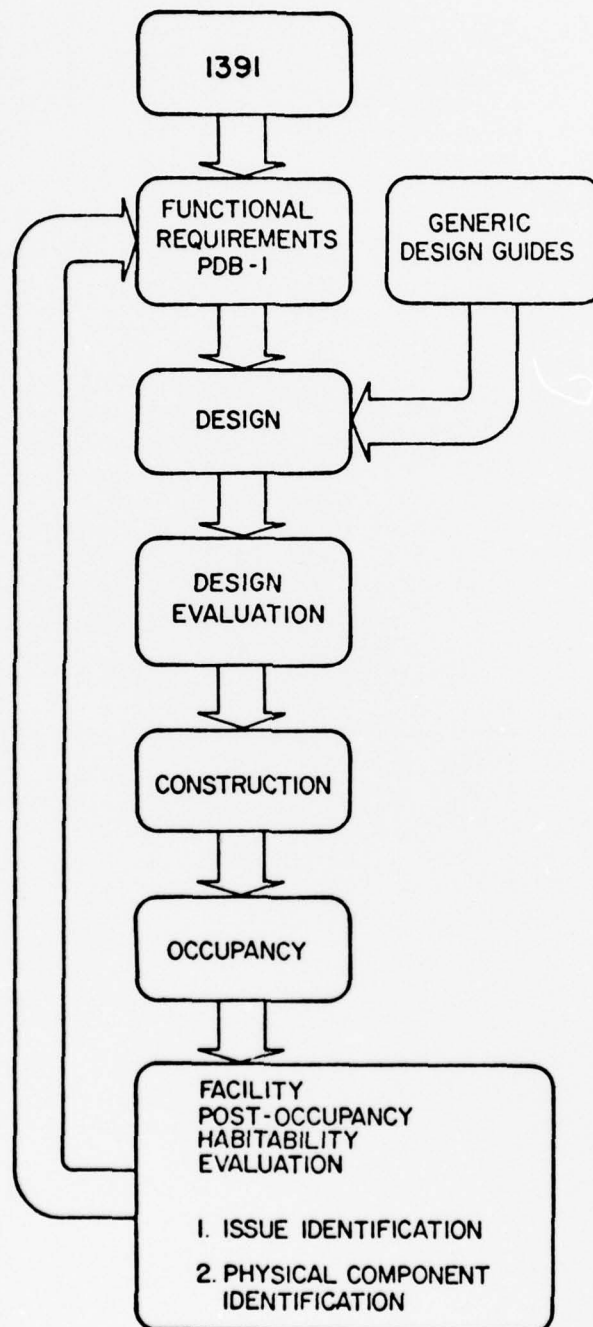
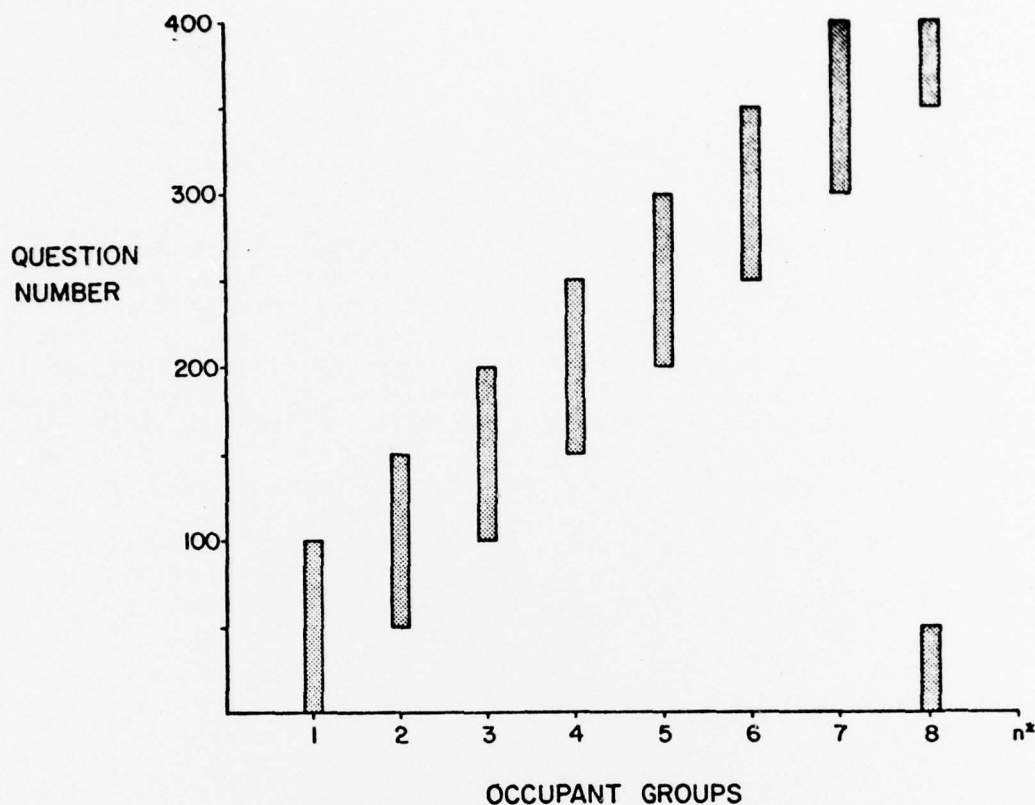


Figure 2. Evaluation feedback to the design process.



\* For groups beyond the eighth, the administration plan is reiterated.

Figure 3. Administration of questionnaires.

Appendix B shows an example checklist that would allow the occupant to rate degree of satisfaction with the behavioral and functional aspects of the new facility. The results should be numerically averaged at the installation and used in at least two important ways: (1) as a reason for an inspection team visit if none was routinely planned, and (2) as information to identify areas for more detailed inspection by the team.

Copies of the rating results and the inspection team's trip reports (which isolate the physical sources of the problems) should be maintained as part of the data file. This information will contribute to the long-term effort of refining and producing a habitability evaluation package that will be important as a field tool for evaluating facilities and for providing feed-forward information for future design.

APPENDIX A:

QUESTIONNAIRE FOR FACILITY EVALUATION

The following questionnaire has been designed as part of the continuous effort to provide the best possible facilities for Army personnel. The purpose of the questions may be different from any other questionnaire you've completed as we are looking at the relationship between the building itself and your psychological reactions to it. While some of the questions may seem "strange" to you, please think about them and answer as honestly as you can. There are no right or wrong answers to the questions but only those that best express your own feelings.

Please note the definition of words you will find in the questionnaire:

WORK SPACE: the immediate physical space where you perform your job duties.

WORK AREA: the physical area where you and your work group perform their tasks

WORK GROUP: your immediate supervisor and all the people you work with who report directly to him or her.

Thank you for your cooperation and assistance.



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1. Do you find your work station flexible enough to meet your changing requirements.
  - a. Very flexible, I can change it as necessary
  - b. Fairly flexible, I can change it if I have to
  - c. About average
  - d. Fairly inflexible, it takes a lot of effort to change it around
  - e. Very inflexible, I could not change it if I wanted to
2. Can you rearrange your work area?
  - a. Yes, I can completely rearrange it
  - b. Yes, I can rearrange it somewhat
  - c. No, I can rearrange it very little
  - d. No, I can't rearrange it at all
3. Do you think the general floor plan of this building is:
  - a. Very well laid out
  - b. Well laid out
  - c. Not too well laid out
  - d. Poorly laid out
4. Do you have a separate break area?
  - a. Yes
  - b. No
5. Looking at your work space would you describe it as:
  - a. Very personal
  - b. Quite personal
  - c. Quite impersonal
  - d. Very impersonal
6. Is it important for you to be able to control who and when people can have access to you?
  - a. Very important
  - b. Moderately important
  - c. It really makes no difference
  - d. Not very important
  - e. Not important at all
7. Do people have to go through your work space to get to another work space?
  - a. Very often
  - b. Often
  - c. Sometimes
  - d. Seldom
  - e. Never
8. How would you rate the comfort of your furniture?
  - a. Very comfortable
  - b. Quite comfortable
  - c. Acceptable
  - d. Quite uncomfortable
  - e. Very uncomfortable
9. How would you describe the colors in your work area?
  - a. Very colorful
  - b. Colorful
  - c. Drab
  - d. Very drab
10. How would you describe the complexity of the arrangement of rooms and hallways?
  - a. Very simple
  - b. Fairly simple
  - c. Average
  - d. Fairly complex
  - e. Very complex

11. Does your work space accommodate the equipment and personnel using it?
  - a. It is very satisfactory
  - b. It is satisfactory
  - c. It is acceptable
  - d. It is unsatisfactory
  - e. It is very unsatisfactory
12. Is the size of your work space adequate to perform your job?
  - a. Very adequate
  - b. Fairly adequate
  - c. Acceptable
  - d. Fairly inadequate
  - e. Very inadequate
13. Does the arrangement of your work space have any effect on the amount of time you spend talking to your co-workers?
  - a. No problem, can talk as long as wanted or necessary
  - b. Some problems, can talk only for short periods of time
  - c. Nearly impossible to talk for any time at all
14. How much of your conversation at work is due to the open distance between you and other persons you work with?
  - a. 0-20%
  - b. 21-40%
  - c. 41-60%
  - d. 61-80%
  - e. 81-100%
15. How do you feel about people watching you at work?
  - a. I don't like it and it bothers me to have someone over my shoulder
  - b. I would rather be able to work privately
  - c. It really doesn't bother me
  - d. I sort of like it, maybe someone watching can learn from me
  - e. I would prefer to have someone watch me
16. Are your conversations at work due to your orientation to others you work with (i.e. all face the same direction, face each other, etc.)?
  - a. 0-20%
  - b. 21-40%
  - c. 41-60%
  - d. 61-80%
  - e. 81-100%
17. How often are you asked for directions in this building?
  - a. Very often
  - b. Often
  - c. Sometimes
  - d. Seldom
  - e. Almost never
18. How do you feel about your personal privacy?
  - a. I have as much as I want
  - b. I have quite a bit
  - c. I have about the same as others here
  - d. I don't have very much
  - e. I have none at all
19. When you're in a small, cramped space (such as a crowded elevator) do you have a feeling of being "shut in?"
  - a. Never, those conditions don't bother me
  - b. Not very often, I'm used to it
  - c. Occasionally
  - d. A lot of the time, I don't really like being cramped
  - e. Always, I feel very uncomfortable under those conditions.
20. Does being indoors long, away from the fresh outdoors, makes you feel stale.
  - a. Absolutely, all the time
  - b. It happens fairly often
  - c. Never thought about it
  - d. Not very often
  - e. Never

21. How important is it to you to be able to close a door to achieve privacy?
- Very important
  - Moderately important
  - It really makes no difference
  - Not very important
  - Not important at all
22. Do you feel that your work space belongs to you?
- Completely
  - To a large degree
  - Somewhat
  - Very little
  - Not at all
23. Does your work area have any special hardware or equipment which "defines" it? (egs: grease pit, computer terminal, drawing board.)
- No
  - Yes
- List \_\_\_\_\_
24. How would you describe the floor plan of this building?
- Very confusing and difficult to find your way around
  - Somewhat confusing but it doesn't take long to get used to it
  - Not very confusing or difficult to find your way around
  - Not confusing at all and very easy to find your way around.
25. How would you describe your work space?
- Very formal
  - Quite formal
  - Quite informal
  - Very informal
26. How would you describe your facility?
- Very formal
  - Quite formal
  - Quite informal
  - Very informal
27. If you had to rearrange your work area would the building allow you to do it. That is would you be able to reach outlets, switches, airhose, gas lines, etc.?
- No, it would be impossible
  - It would be difficult
  - It could be done fairly easily
  - It would be very easy
28. Is the size of your work space adjustable (can you make it larger or smaller)?
- Yes
  - No
29. Are any of your work surfaces adjustable?
- Yes
  - No
30. Do you have problems getting large furniture or tools to your work space?
- Very often
  - Often
  - Sometimes
  - Seldom
  - Never
31. Do people gather in the hallways and talk there in small groups (2-4 people)?
- Almost always there are people talking in the hall
  - Quite often
  - Occasionally
  - Not very often
  - Almost never

32. Would you call your work area active in that there is always something going on there?
- a. Very active
  - b. Fairly active
  - c. Above average
  - d. Fairly inactive
  - e. Very inactive
33. In the area where you perform your work activities, would you rather:
- a. Have a space of your own that you control completely
  - b. Have some control but don't mind sharing
  - c. Prefer to completely share a work space
34. Does it bother you when people around you make noise while you are working?
- a. Always
  - b. Quite often
  - c. Occasionally
  - d. Not very often
  - e. Never
35. When you are talking to someone in your work space how often is it work related?
- a. 0-20%
  - b. 21-40%
  - c. 41-60%
  - d. 61-80%
  - e. 81-100%
36. Once you are in the building, how easy is it for a person to locate restrooms, elevators, phones, etc. without needing to hunt or ask?
- a. Very easy
  - b. Moderately easy
  - c. No real problems
  - d. Moderately difficult
  - e. Very difficult
37. The work space and furniture in our work group is:
- a. Excellent
  - b. Good
  - c. Passable
  - d. Somewhat unsatisfactory
  - e. Poor
38. The condition of the equipment and supplies used in my work group is:
- a. Poor
  - b. Unsatisfactory
  - c. Fair
  - d. Good
  - e. Excellent
39. How easy is it to get to your work area?
- a. Very easy, direct path
  - b. Fairly easy, almost a direct path
  - c. Not too difficult once you're use to it
  - d. Fairly difficult, there are some obstacles like walls and doors
  - e. Very difficult, doors, walls, and hallways all the way
40. How easy is it to move from one area of this building to another where you might have to go?
- a. Very difficult
  - b. Difficult
  - c. Not too bad
  - d. Easy
  - e. Very easy
41. How much time do you spend sitting doing work related activities?
- a. 0-20%
  - b. 21-40%
  - c. 41-60%
  - d. 61-80%
  - e. 81-100%



42. Do you work with tools and equipment as part of your job?
- Very often
  - Often
  - Occasionally
  - Seldom
  - Very seldom
43. This building needs repair:
- Almost always
  - Quite frequently
  - About average
  - Quite seldom
  - Almost never
44. Would you call your workspace a "center of activity"?
- Yes
  - No
45. How often do you move tools, equipment, references, etc. to your work area?
- Very often
  - Often
  - Occasionally
  - Seldom
  - Very seldom
46. How much time do you spend moving to other work areas as part of your job?
- 0-20%
  - 21-40%
  - 41-60%
  - 61-80%
  - 81-100%
47. Do you have many visual distractions in your work area that bother you?
- No, none at all
  - No, not really
  - About average
  - Yes, quite a few
  - Yes, they seem to be everywhere
48. Does the shape of your work space determine how you do your job?
- Completely
  - To a great extent
  - Somewhat
  - Very little
  - Not at all
49. How many tasks do you perform on your job which you consider relatively unimportant or unnecessary?
- Nearly all
  - Quite a few
  - A few
  - Very few
  - Practically none
50. How adequate is the sign system in this building?
- Very adequate
  - Somewhat adequate
  - Barely adequate
  - Somewhat inadequate
  - Very inadequate
51. How often do people come to your work space to visit?
- Very often
  - Quite often
  - Once in a while
  - Not very often
  - Almost never
52. How often do you have opportunities to work on different jobs?
- Never
  - Rarely
  - Sometimes
  - Often
  - Nearly all the time

53. Were you able to select the furnishings in your work space?
- Yes
  - No
54. Is your name displayed anywhere in your work space?
- Yes
  - No
55. Does your work space allow you to perform different tasks or only a limited few?
- I can do a great many different tasks
  - I can do quite a few
  - I can't do too many
  - I can only do very few
56. Have you arranged your room to suit your own needs?
- Completely
  - To a large degree
  - Somewhat
  - Very little
  - Not at all
57. Do you have a control over the heating of your work space? (i.e., adjust thermostat, set air conditioner, etc.)
- Yes
  - No
58. How important is it for you to be completely by yourself when you want to?
- Very important
  - Fairly important
  - Makes no difference
  - Not very important
  - Not important at all
59. How often is the amount of light, heat or air in your work area so bad that it bothers you?
- Almost always
  - Usually
  - Sometimes
  - Seldom
  - Almost never
60. Do you have control over the ventilation in your work space? (i.e., open a window, turn on a fan?)
- Yes
  - No
61. Is there anything in your workspace that has an influence on conversations there? (egs: excessive heat, noise, odors, etc.)
- No
  - Yes
- List \_\_\_\_\_
62. Do you have a boundary to your workstation? (i.e., wall, file cabinet, work bench)
- No
  - Yes
- List \_\_\_\_\_
63. Is your workspace interesting enough that other people "explore" it (look at it closely)?
- Very interesting and inviting
  - Fairly interesting and inviting
  - It's nothing special
  - Fairly uninteresting and uninviting
  - Very uninteresting and uninviting

64. How would you describe your work area?
- a. Very active
  - b. Active
  - c. Average
  - d. Inactive
  - e. Very inactive
65. Is there any object that draws people to your work area? (such as coffee pot, drinking fountain, etc.)
- a. No
  - b. Yes
- List \_\_\_\_\_
66. Generally speaking, how satisfied are you with the kind of work you have to do on your job?
- a. Very dissatisfied
  - b. Dissatisfied
  - c. Indifferent
  - d. Satisfied
  - e. Very satisfied
67. Would a stranger be able to tell what you do by looking at your work space?
- a. Definitely
  - b. Probably
  - c. Probably not
  - d. Definitely not
68. Do you have enough privacy for telephone calls?
- a. Almost always
  - b. Quite often
  - c. Occasionally
  - d. Not very often
  - e. Almost never
69. How much do directories, signs and markers help people find their way through this building?
- a. Help very much
  - b. Help a little
  - c. Help some
  - d. Don't help much
  - e. Don't help at all
70. Are your work surfaces adequate to perform your job? (i.e., desks, tables, work benches, etc.)
- a. Very adequate
  - b. Moderately adequate
  - c. Acceptable
  - d. Fairly inadequate
  - e. Very Inadequate
71. Do you find privacy a problem?
- a. Almost always
  - b. Usually
  - c. Sometimes
  - d. Seldom
  - e. Never
72. Are you able to have confidential conversations?
- a. At no time
  - b. Very rarely
  - c. Sometimes
  - d. Quite often
  - e. Almost anytime
73. How often does a ringing telephone (or someone else) distract you from what you are trying to do?
- a. Almost always
  - b. Quite often
  - c. Occasionally
  - d. Not very often
  - e. Almost never
74. Is it important for you to be able to choose your furnishings so that they match in color, style, etc.?
- a. Very important
  - b. Moderately important
  - c. It really makes no difference
  - d. Not very important
  - e. Not important at all

75. Is your work space arranged so that you don't have to waste a lot of effort (walk, reaching, etc.) to perform your job?
- Very well arranged
  - Well arranged
  - Acceptable
  - Poorly arranged
  - Very poorly arranged
76. How many of your conversations at work are with other people who work close to you (say within 20 feet)?
- 0-20%
  - 21-40%
  - 41-60%
  - 61-80%
  - 81-100%
77. Do you have any personal items in your work space? (like posters, figures, ashtrays, photos, etc.)
- No
  - Yes
- List \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
78. Would you describe your work area as:
- Very ordered
  - Somewhat ordered
  - Average
  - Somewhat disordered
  - Very disordered
79. Did you have any voice in the selection of equipment for your work space (tools, typewriters, adding machines, welders, etc.)?
- Yes, and it made a difference in selection
  - Yes, but it made no difference
  - No, but it made no difference
  - No, and I wish I would have
80. How often do other conversations distract you from what you are trying to do?
- Almost never
  - Not very often
  - Occasionally
  - Quite often
  - Almost always
81. The cleanliness and up-keep of the restrooms and other facilities we use is:
- Very poor
  - Poor
  - Passable
  - Good
  - Very good
82. Do you have control over the lighting in your work space? (i.e., close the drapes or blinds, turn on or off more than one light).
- Yes
  - No
83. When you are not at your work space do you have problems with people being there that shouldn't be there?
- Very often
  - Fairly often
  - Occasionally
  - Seldom
  - Never
84. Are you satisfied with the number of people you have to share space with?
- Highly dissatisfied
  - Moderately dissatisfied
  - Seems to be alright
  - Moderately satisfied
  - Highly satisfied



85. Are you satisfied with the number of people you have to share space with?

- a. Highly satisfied, never any problems
- b. Quite satisfied, few problems
- c. It's acceptable
- d. A little dissatisfied, there is often crowding
- e. Very dissatisfied, it is always crowded

86. Procedures are designed so that equipment is used efficiently.

- a. Strongly agree
- b. Agree
- c. Not sure
- d. Disagree
- e. Strongly disagree

87. Is your work space easy to find:

- a. Very easy
- b. Fairly easy
- c. Fairly difficult
- d. Very difficult

88. Are you ever crowded in your work area?

- a. Almost always
- b. Often
- c. Sometimes
- d. Rarely
- e. Almost never

89. Are there any activities for which no space is provided?

- a. No
  - b. Yes
- List \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

90. Sex:

- a. Male
- b. Female

91. Years of military service: \_\_\_\_\_

92. Race:

- \_\_\_\_\_ Black
- \_\_\_\_\_ White
- \_\_\_\_\_ Spanish-American
- \_\_\_\_\_ Oriental
- \_\_\_\_\_ Other: \_\_\_\_\_

93. Age:

- \_\_\_\_\_ 19 or younger
- \_\_\_\_\_ 20-25
- \_\_\_\_\_ 26-30
- \_\_\_\_\_ 31-35
- \_\_\_\_\_ 36-40
- \_\_\_\_\_ 41 or older

94. What is your level of education?

- a. High school graduate
- b. Some college
- c. College graduate
- d. Master's degree
- e. PhD or professional degree (i.e., D.D.S., M.D., etc.)

95. What is your pay grade? \_\_\_\_\_

96. Do you intend to re-enlist when this tour is up?

- a. Yes
- b. Probably
- c. Not sure
- d. Probably not
- e. No
- f. Retirement

# APPENDIX B:

## EXAMPLE CHECKLIST FOR FACILITY EVALUATION

OCCUPANT REQUIREMENT	FACILITY RATING								COMMENTS
	IMPORTANT				UNIMPORTANT				
PRIVACY-to make phone calls, be by yourself not have some one "over your shoulder", etc.									
SOCIABILITY-where you are able to have conversations, several others can be present, etc.									
FORMALITY-where only certain activities are allowed and there is a place for everything, etc.									
CHOICE-where you can choose to open a window, select your own seat, control the lights, etc.									
COMFORT-where the working levels are an appropriate height, no noise problem and furnishings are pleasant to look at, etc.									
IMAGERY-where your space is identifiable in relation to its purpose (for example, a library looks like a library) or it can be identified by a sign or symbol, etc.									
EFFICIENCY-where it is easy to move around in your space (people traffic and work flow are no problem) and the furnishings and surfaces are sturdy and use-resistant, etc.									
ACTIVITY-where you find the space allows active usage through the use of colors, furnishings, etc.									
FLEXIBILITY-where you need a space that is easily rearranged or modified to allow various usage and furnishings, etc.									
TASK PERFORMANCE-where your space is adequate to perform your job (storage, shelves, desk surface, tables, etc.)									
TERRITORIALITY-where you are able to "own" your space and personalize it with pictures, posters, etc.									
CROWDING-where you don't find that your space is occupied by too many people so that you feel cramped.									

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